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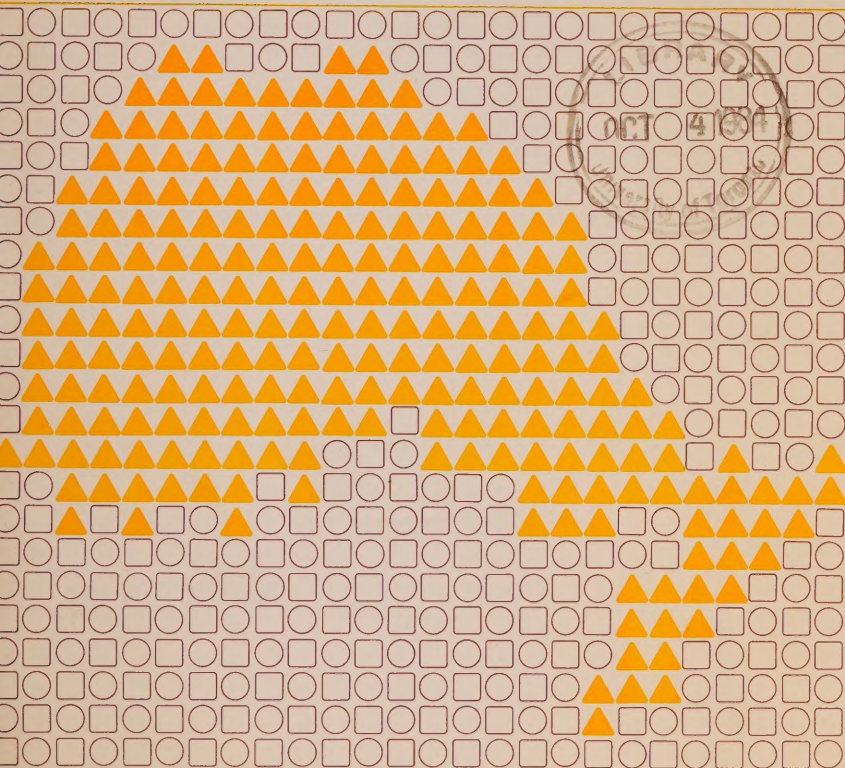
Occupational
Health and Safety
Division

Occupational
Health Branch

Occupational Health in Ontario

Volume 2, Number 2 April, 1981

Transportation of Hazardous Goods—1
Transportation of Hazardous Goods—2
The Process of Emergency Response
Chemical Transportation Emergency Response
Capabilities of Response
Capabilities of Medical Services and Hospitals in
Responding to Emergencies and Catastrophes



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1. Lee W.R. and Miles S. (1976): *Postgraduate preparation for occupational medicine*. Journal of the Society of Occupational Medicine 26, 115-119.
2. Department of Health and Social Security (1972): *Notes on the Diagnosis of Occupational Diseases*, rev. ed. London, HMSO, p. 19.
3. Gamble J.F. and Battigelli M.C., 1978, *Epidemiology*. Published in Clayton G.D. and Clayton F.E. (ed) *Patty's Industrial Hygiene and Toxicology*, Vol. I, New York, McGraw Hill, pp. 113-116.

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Editorial

This issue of *Occupational Health in Ontario* is devoted to the theme of provincial preparedness in cases of emergency.

The articles reprinted here have been selected from the many papers delivered to emergency planners from around the world by officials of the Canadian and Ontario governments and municipalities, industry and the medical profession at a four-day conference on emergency preparedness for the eighties, held at Toronto in November, 1980.

The conference was organized as a result of the overwhelming world-wide interest in the Mississauga train derailment of November, 1979 which released a cargo of chlorine gas, and in the subsequent evacuation of the entire population of that city. The evacuation has been hailed as the largest and most successful operation of its kind in North American history.

The conference was sponsored jointly by the ministry of the solicitor general and the Association of Ontario Municipalities, and dealt with emergency planning from concept and organization to implementation and recovery.

Said Colin R. Phillips, conference chairman: "This conference. . . addresses the subject of emergency preparedness at a time of increased public awareness of the impact of both natural and man-made disasters."

The six articles that make up this issue examine the nature of emergencies and capabilities of response, and strategies and possible solutions: the principles of planning and response. They were chosen as being representative of the concerns felt by emergency planners about the problems of emergency preparedness and response, and as being indicative of the dedication and enthusiasm with which these problems are being tackled. They have been slightly edited for print.

M. Stailkovich and C. O'Connor, in their paper *Transportation of Hazardous Goods*¹, discuss the need for a single, co-ordinated and coherent set of safety standards and procedures to govern the handling and

transporting of dangerous goods by all modes of transport and the quality of emergency preparedness and response to the real and potential disasters that result from accidents involving hazardous materials.

The authors explain the Transportation of Dangerous Goods Act which was formulated by the federal government in response to this need and which is specifically related to emergency preparedness. It is hoped that the new act, not yet fully implemented, will do much to reduce the risk of accidents and lessen the potential danger caused by the discharge, emission or escape of dangerous goods should an accident occur.

*Transportation of Hazardous Goods*² by D. L. Fletcher outlines the current response capabilities of CN Rail to train derailments that do not involve dangerous cargoes, and goes on to examine the more complex requirements of emergency response to rail accidents that do involve dangerous commodities, and the efforts of CN Rail to meet them.

In the words of C. L. Kirby of the ministry of the solicitor general and author of *The Process of Emergency Preparedness*, "The province of Ontario is subject to the full range of emergencies, natural and otherwise, faced by one large, diverse and highly-developed community. . . .

"The aim of this paper is to describe in general terms the process of response to emergencies in Ontario. Its scope [includes] the conceptual, organizational, planning, operational and recovery aspects of the process."

Chemical Transportation Emergency Response by Wilburt L. Cannif contains an interesting description of the Transportation Emergency Assistance Plan (TEAP) managed by the Canadian Chemical Producer's Association.

Capabilities of Response by John Lawler reviews some of the highlights of the response capabilities, based on pre-disaster planning, of heavy industry in south-western Ontario. Close co-operation between regional authorities, industry and local hospitals is stressed.

In answer to what Dr. D. A. Psutka, in his paper *Capabilities of Medical Services and Hospitals in Responding to Emergencies and Catastrophes* calls the "ineffective" response capabilities of Canadian medical

facilities in times of disaster, and even small emergencies, he presents his recommendations for the improvement of the ways in which disasters are met by Canadian medical services, hospitals and hospital staffs.

These six papers collectively provide an overview of the problems associated with disaster planning, and thereby make a useful contribution to the growing need for information and guidance on this increasingly important topic.

Transportation of Hazardous Goods-1

Increasing quantities of dangerous goods are moving through the transportation system. So far Canada has been fortunate that the number of accidents involving dangerous goods have been relatively infrequent. But there were the Mississauga and MacGregor Lake accidents. These accidents received massive publicity and created a public awareness and an outcry for stricter control of the movement of such products.

There are more frequent 'smaller' incidents which, although not receiving 'sensational' billing, are still of importance due to the threat posed to our communities.

Examples of Accidents

1. In West Brome, Quebec, June, 1979, a truck collided with a train and resulted in 15 cars being derailed. Two of the derailed cars contained propane gas and three cars were loaded with an alcohol base solution. Two of the latter cars leaked and although the tanker cars carrying the propane did not rupture they still posed a potential hazard. 200 residents living in the immediate area were evacuated.

2. Thunder Bay, Ontario, November, 1978, a collision occurred between an 80-car train carrying grain and a 36-car train carrying sulphuric acid. Four tank cars containing the sulphuric acid ruptured, spilling an estimated 40,000 gallons. Due to favourable winds an evacuation of the area's residents was avoided, but the mixture of sulphuric acid and grain posed a danger of explosion.

3. London, Ontario, June, 1980, 34 cars derailed, creating multiple incidents - one car carrying 75 tons of coal tar light oil caught fire; a propane car exploded and the resulting fire consumed four other cars; there was a threatened leak from a tank car containing sulphur dioxide, a poisonous gas. Other cars attached to the train were 'empty' butane tanks and chlorine tanks. Approximately 400 area residents were evacuated.

4. Sterling, Alberta, September, 1978. A 120-car CP train carrying approximately 130,000 gallons of butane derailed – some of the tank cars spilled their contents. 600 people were evacuated from their homes.

This is just a small sampling of the accidents involving the transport of dangerous goods and although drawn from the rail mode, I can assure you that similar accidents occur involving motor vehicles. These examples serve to illustrate the potential dangers involved. The results of our experiences tell us that emergency preparedness plans are necessary to meet the continued and growing potential for disaster from the transportation of dangerous goods.

If past history is not enough to create the necessary warnings, some communities are commissioning studies regarding potential dangers involving dangerous goods found in their area. For example, the North Vancouver District Council commissioned Beak Consultants Ltd. to conduct a study of the potential consequences related to the production, storage and transporting of chlorine by Hooker Chemical Ltd. The findings suggested possible disasters which bordered on the catastrophic.

The principles conclusions are:

1. The statistical likelihood exists that an accidental spill could occur every 8 years resulting in the deaths of 68 people.
2. In the event of an earthquake (Vancouver lies in the zone of maximum seismic hazard in Canada), the damage to the plant and storage facilities would result in 198 deaths.
3. Chlorine spills result in tremendous pollution damage.
4. The results of sabotage to a railcar carrying chlorine could be horrendous.
5. Derailment of cars transporting chlorine could result in massive evacuation.

Although one might dispute the exact figures and consequences arrived at, the conclusions reached by this

report serve a valuable and useful purpose – they point out the need for a co-ordinated emergency response system, involving police, fire and other key personnel, designed to meet potential catastrophes resulting from the handling and transporting of dangerous goods.

Transport Canada's Role

The Transportation of Dangerous Goods Act was formulated as a single coherent legislative authority under which appropriate existing agencies (whether federal or provincial) can enforce a single set of regulations of safety standards and procedures in all handling and transportation of dangerous goods. Up to now, and until this act is fully implemented, there has been a complex, and sometimes conflicting, maze of regulations, unevenly administered by the different levels of government and agencies responsible for them. There were some 20 federal departments and agencies involved and, between Transport Canada and the CTC alone, three types of internationally based regulations existed. Thus the need for one co-ordinated set of regulations was apparent.

The act deals with the handling and offering for transport and the transporting of dangerous goods by all modes of transport. Not only is the increase in transportation of dangerous goods of prime importance but also the recognition that intermodal shipments in transport is a major factor. Having one set of regulations governing 'all' modes of transport is essential to achieve the level of safety called for. If industry is expected to comply with safety standards, then those standards pertaining to all modes must be clear and coherent so as to make compliance with the regulation forthcoming and eliminate the possibility that industry could ignore or bypass regulations that are contradictory or complicated.

Specifically related to emergency preparedness, the act provides for the appointment of qualified persons as inspectors. Their duties will be (under Sections 14 and 15):

1. to inspect goods, packages, conveyances, facilities and storage places to ensure that the necessary precautions are being adhered to with respect to dangerous goods, and
2. to take or request measures deemed necessary to prevent any damage likely to occur as the result of improper handling or transporting of dangerous

goods. These measures include seizure, removal and destruction of the goods or property and any other measures which seem necessary. The inspector can also refuse entry into Canada of goods which do not meet the standards required under the act, (i.e. packaging).

The act (Section 17) provides for remedial measures to be taken either by the inspectors or by other responsible individuals whenever an escape, discharge or emission of dangerous goods occurs; and the act imposes strict liability for expenses incurred by the Crown in the preventing, reducing, or remedying any resulting damage (Section 18).

Further provisions (Section 19) require that the persons responsible for shipment of high risk goods show, when requested, evidence of reasonable financial means (i.e. insurance) to cover the potential damage that would be caused in the case of discharge, emission or escape of these goods.

In order to assess the effectiveness of the regulations, the minister may establish, under Section 20, an inquiry into the cause of any particular discharge, emission or escape of dangerous goods.

The minister is also given the power to act in an emergency situation (such as Mississauga), both in terms of dealing with the immediate consequences and with the aim of preventing a recurrence (Section 38). This same provision allows for the delegation of those powers to appropriate personnel in emergency response.

The accompanying regulations to be promulgated under the act will set forth:

1. the standards for packaging of dangerous goods intended for transport,
2. the classification criteria for designating goods as dangerous,
3. the documentation, labelling, marking and placarding that must accompany the dangerous goods, and
4. the responsibilities of those handling or offering dangerous goods for transport.

In establishing and implementing these uniform and standardized procedures, it is expected that accidents

resulting from improper packaging and/or handling of dangerous goods will be reduced.

These regulations also provide emergency response personnel with a standard system of marking which will facilitate the identification of material they are dealing with and speed the taking of emergency measures that should be followed in the event of an accident or in preventing further damage or catastrophe.

Having regulations in force does not necessarily ensure an accident-free environment for the transportation of dangerous goods. There must be other related resources available to complement this new act, to meet the changing and often 'unique' situations which arise in dealing with dangerous goods.

One important resource to all emergency response personnel is the *Emergency Response Guide for Dangerous Goods*, a publication produced by Transport of Dangerous Goods Branch of Transport Canada. This is essentially a handbook which gives the numerical and alphabetical listings (in both English and French) of dangerous goods and the generalized and abbreviated hazard response information and properties associated with these goods. More detailed and specialized information is available from the Transport Canada Information and Emergency Centre (CANUTEC) which operates 24-hours a day, seven days a week.

The centre has more than 8,000 information cards dealing with dangerous products, giving the technical name, classification, names and addresses of manufacturers and shippers, physical properties of the chemicals and the potential dangers to life, property or the environment; action to be taken in emergency situations - i.e. how to deal with fire, spills, leaks, exposures, first aid measures and areas in which to consider evacuation. Also available to the centre's staff is a reference library of related materials such as trade names and the location of emergency response forces.

The centre can set up conference lines permitting direct communication between the emergency response personnel on the scene of an accident and the organization, wherever it may be, that can provide the best advice to those on the scene.

The Risk Analysis Section is responsible for analyzing the frequency and causes of accidents, the magnitude of the associated consequences in order to determine the 'risk' involved of transporting dangerous goods. The analysis coupled with the collection of production and flow data of dangerous goods permits the

identification of high risk corridors in Canada. With this knowledge on hand, emergency response personnel will be able to plan, and prepare measures to meet potential accidents – in terms of resources, equipment and training required. The Risk Analysis Section will also provide expertise and assistance in the method of developing data on dangerous goods movements for emergency planning.

One final aspect of the analysis and work performed by this unit is into the causes of accidents – i.e. packaging and mechanical faults – in order to provide input to the Standards Development Section of the branch to assist in determining whether the present regulations are satisfactory to safeguard the products being carried.

Another vital step in emergency preparedness is the training of key personnel as well as the promotion of public awareness in the field of dangerous goods safety.

The Training Section will provide training seminars to inspectors (appointed under the act) from federal and provincial departments or agencies involved in the implementation program. The section also provides assistance in the developing and evaluating of related training programs such as those that might be produced by industrial groups.

In summary, the Transport of Dangerous Goods Branch's mandate is to promote safety in all aspects of the transporting of dangerous goods and to ensure that all specialized agencies are free to play their full and vital roles. The program represents a concerted effort covering the many aspects involved, from the legislation and regulations, to the extensive supporting services provided to industry, inspectors and emergency response units. Dangerous goods will continue to be moved through our transportation system, a fact of life we not only must live with, but must be prepared to deal with effectively.

Transportation of Hazardous Goods – 2

In approaching this subject, it might help to touch briefly on our preparedness to react to the average railway derailment and then identify the extra considerations in dealing with a dangerous commodity incident.

In dealing with the average railway derailment, the main needs are:

1. an instant communication between train and dispatching office to report the occurrence,
2. the ability to quickly identify the train consist, commodities, marshalling, etc.,
3. the prompt dispatch of the needed auxiliary cranes, heavy equipment, and track material,
4. a follow-up report from the crew and, if possible, a detailed description of the nature of the problem by a supervisor,
5. a precise organizational arrangement at the scene to manage, in a safe and efficient manner, a fairly large, interdependent workforce from several departments.

On CN Rail, every train is radio-equipped and can contact its dispatching office immediately to report a problem. The 18 dispatching offices have private or dedicated communication to the appropriate Regional Control Centre, which is staffed 24 hours a day 7 days a week with a senior transportation officer.

Both the dispatching office and the Regional Control Centre have instant access to the central computer and immediately obtain a train consist of the train involved. The dispatching office has a complete list of the emergency organizations of all municipalities in its territory and is responsible for immediate reports to them if they are needed as well as to all local railway officers.

The Regional Control Centre is responsible for getting immediate reports to our Headquarters Control Centre and to regional management.

The objective being that within the first 20 minutes, all the key people are notified and, within one hour, the emergency equipment is on its way.

While this is happening, a more detailed inspection of the accident site is being performed and a more precise 'game plan' is being evolved by the transportation, equipment, and engineering supervisors, who have assembled at the scene or, if excessive distance is involved, at the dispatching office.

During this process and after the equipment and manpower arrive at the scene, this inter-functional team operates under a procedures manual which specifies the organizational approach and authorities, etc., to produce a safe and efficient clean-up.

As indicated earlier, this describes the procedures applying to the average railway derailment in which the incident does not include any abnormal elements. No danger exists to those beyond our property line and no external assistance or communications, other than perhaps with the Railway Transport Committee, is needed.

We feel we are well equipped to deal with this type of situation. However, the ever increasing volume of dangerous commodities in our total workload, and the possibility of its becoming involved in a mishap is, of course, creating the need to broaden our thinking on emergency preparedness and leads us to the topic of this panel.

The topic of this panel 'Emergency Preparedness' in the transportation of dangerous commodities presupposes that all of the preventive actions taken will fail at some time in the future and that indeed an 'emergency response' will be required.

We are quite proud of the preventive work done within CN Rail over the past few years. There are a multitude of programs but suffice it to say that train and yard movement accidents were reduced 61 per cent between 1974 and the end of 1979. So far, in 1980, a further 30 per cent improvement is being recorded over the 1979 figure.

This places us, along with CP Rail, among the top four Class I railways in North America.

Notwithstanding those preventive programs, prudence dictates that emergency preparedness is required. . . One of the major problems in developing a more sophisticated response capability is lack of practice or

experience. Within CN Rail, and during my 33 years of experience, we have had only one major incident involving dangerous commodities and that was at MacGregor, Manitoba, in March, 1980. The Canadian Transport Commission, in its investigation of this incident, stated amongst its conclusions that

“ . . . the cause (of the accident) is found to have been one that would be undetectable within the most stringent safety measures that could be expected. . . . ”

and that

“ . . . in general the clean-up was safe, professional and efficient. . . . ”

[The commission] also stated that there were many lessons to be learned from this single experience and I can assure you that we intend to [learn them]. Since this incident, and since the filing of the commission's report, we have been working on improving our response and are approaching the time when we will be trying to involve the other parties mentioned in the enquiry report as necessary assistants in this process.

In developing this [emergency] response, there are some significant factors that a railway faces that are quite different from those faced by a chemical plant or other operation. . . with a fence around it, with fixed emergency facilities strategically located and with a smaller, closely supervised and specialized workforce.

First – There is the problem of geography. We operate an average of 750 trains a day over some 23,000 miles of track from Halifax to Vancouver – through major cities, small towns, rural, and even wilderness, territory – and have absolutely no control over the land use adjacent to our property line.

Second – These train operations are handled by over 13,000 different operating employees and may be supported by some 17,000 other employees [including our] maintenance staffs and [those who work] in our yard. The training and supervision of such a large and mobile workforce poses some rather particular problems.

Third – Our responsibilities to provide service as a common carrier may require the movement of any one of the 1,750 identified dangerous commodities over any

of these route miles handled by any of our employees at any time.

Given this environment, what, then, should our response capability be, and how well are we meeting it?

It seems to us that we cannot logically expect to make chemical engineers of our 30,000 field operating employees, or expect them to understand *all* of the actions or hazards of *every* commodity, let alone the consequences of their being mixed, should this occur.

This leads us to providing a set of rules and general instructions on the key 'do's and don'ts.' We also provide instruction and examination on these rules. The rules and the general instructions must be accessible for ready reference while working, and they form part of a bi-annual rules examination. We are currently nearing the end of a 10-month program to update this instruction and examination involving 329 instructors, 30,000 employees and an expense of \$1.3 million.

In addition, we have a group of specialists strategically located across the system who work full-time on the movement of dangerous commodities, inspecting facilities and equipment, inspecting compliance with rules and regulations and instructing supervisors and employees.

These special commodities officers are our internal resource in the event of an emergency.

We also have concluded, and I believe this conclusion is shared by the chemical industry and the regulatory agencies, that we must rely on industry experts for detailed advice and assistance in any major emergency. Chemical company experts who work with these commodities all the time are able to stay current in their knowledge of an industry that is constantly developing new products and, perhaps, new problems.

These 'industry experts' assume the role of advisers or consultants and their prime interface with us takes place through our own special commodities officers and transportation officer at the scene of any incident. They also provide equipment and manpower in any cases where special skills are required, and are prepared to perform and supervise the handling of these commodities when necessary.

In our relationship with them, however, it has always been understood that we hold the final responsibility for decisions and there was a very clear example of this described in the MacGregor Accident Report. In the

past this relationship between the industry and ourselves has worked well and the [industry experts'] willingness to assume [the subordinate] role is a tribute to their dedication to public safety. More recently, however, many other parties have become involved and, while we certainly have no objection, this does raise the question of authority and responsibility, particularly should some errors of significance be made. . . .

Another problem is that we cannot provide our own fire and police protection for all 23,000 miles of our property, nor can we control the use made of property adjacent to ours. We may question the building of residential developments up to our fence lines but, in the final analysis, we have to rely on municipal emergency forces to protect our property and to protect our neighbours from a major incident occurring on our property.

How, then, can we respond to maximize the ability of municipal fire, police and other emergency forces in these situations?

First, we can provide them with an awareness of railway operations. We think this should really be done in a co-ordinated 'industry-wide' manner covering all transportation modes. However, in the absence of any legislative framework for this approach, we have held hundreds of information meetings across Canada with fire and police forces in various communities. The purpose of these meetings is to create an awareness of the type of commodities involved, to familiarize the community departments with our abilities and to familiarize ourselves with theirs, and thus [to] create an environment of understanding and co-operation.

We are encouraged that federal authorities are now conducting emergency preparedness courses for these people at Arnprior and we are pleased to be contributing railway expertise at each of these sessions.

Second, we ensure that an accurate train consist is prepared and that each dangerous commodity is properly identified, [that for each dangerous commodity there are] proper Hazardous Information Emergency Response (HIER) documents, [that the] location [of each dangerous commodity] in the train is properly documented and known by the crew, and that crews understand the importance of reviewing these documents and making them available to a properly designated authority in the event of an accident.

We therefore need to know who this 'proper authority' is in order to avoid confusion, loss of vital information, and loss of time in the decision-making process.

In an accident involving outside agencies, we cannot make this decision in isolation. . . .

Third, we can and have provided a reliable internal communications network that alerts the proper people quickly if an accident occurs. . . .

All CN Rail trains are radio-equipped and can contact the train dispatcher immediately. Each dispatching office has an emergency list of contacts for every municipality, rural or urban, through which we operate and immediate internal communications to our own emergency forces, specialists, and senior officers.

Our computer system can print out the train consist (which also identifies all dangerous cars) at any one of a hundred locations across Canada. An 'Emergency Response' printout for each commodity involved can also be printed on request. This 'ER' is more detailed than the information presently included in the HIER form and is the next level of detail in the information chain.

We have offered, through the Mississauga Enquiry, to arrange a computer connection to any municipal fire station or other emergency control centre wishing to have direct access to this information.

Fourth, we have our own emergency car handling and rerailling equipment to be dispatched as quickly as possible to the scene. The crews assigned are specialists in [the] heavy lifting and rerailling of equipment and, while they are not experts in chemical engineering, they are the workforce or 'doing' arm of the 'industry experts'. . . . They are equipped with protective clothing, respirators and a variety of safety tools used in the handling of those commodities. In any exceptional cases. . . we rely on the 'industry experts' when the needs of the situation exceed our own expertise.

This describes the key elements of our preparedness. However, there is still much to do and much to learn from any dangerous commodity incident. By the very nature of railway operations and, indeed, most transportation modes, we cannot become totally self-sufficient in our ability to cope with major incidents. We do have to rely on a variety of sources for help and thus a variety of agencies become involved in preparing such a response. The CTC Enquiry into the MacGregor

accident identified this problem and it seems appropriate here to reproduce some of [its]. . . findings: "In general and with regard to the direct cause of this accident and the clean-up of the wreck, there was no evidence heard which indicated any form of personal negligence. There is, however, ample evidence that serves to demonstrate the need to improve both preventive measures associated with the transportation of dangerous commodities by railways and precautions taken during the clean-up process of a derailment involving dangerous commodities. The areas in need of improvement cross many jurisdictions and centres of responsibility and are not solely associated with the railway company involved in this derailment.

"In the case of this specific derailment there was no loss of life, major or minor injury, substantial environmental damage, or evidence that there will be any residual effects to life or property. This was not solely an outcome of fate. Many individuals performed their assigned duties diligently within the confines of their own knowledge and expertise. Where personal action was found to be inadequate it largely arose from lack of provision of necessary safety equipment, training, and/or previous, direct, practical experience with vinyl chloride monomer or an emergency of this kind.

"A very serious potential hazard nevertheless existed in several time periods after the derailment although the results in retrospect were innocuous. Our findings tend more to identify the areas in need of improvement rather than the actions that were found acceptable or exemplary. The major concern of these findings is therefore what might have happened in this circumstance and what could happen in similar circumstances in the future if present preventive measures and remedial procedures are maintained.

"Our findings are also offered in full recognition that there is no fail-safe system of regulations, rules, standards or procedures coupled with related polic-

ing activities that will prevent *all* accidents from occurring and reduce *all* post-accident hazards to insignificance. . . .”

This report then goes on to discuss a number of things that were done well, [and] some, not so well, and highlights areas of organization and public communication needing improvement. Many of the recommendations have been, or are in the process of being, implemented as the result of our own learning experience gained at MacGregor. Others require participation and, in some cases, leadership, from parties beyond the railway boundary.

Due to space and time constraints and the desire to avoid any suggestion of taking quotes from the MacGregor report out of context, I have not reproduced more of [the CTC Enquiry] findings but I would recommend that every person concerned about these issues read the report carefully and not leave media headlines to be their only contact with this document.

We viewed [the investigation] as a serious attempt to identify areas needing improvement and are encouraged that the commission recognizes that many parties must become involved in devising solutions.

The Process of Emergency Response

Introduction

The province of Ontario is subject to the full range of emergencies, natural and otherwise, faced by any large, diverse and highly-developed community.

It is the responsibility of the three levels of government, each within its own sphere, to plan and act together against these emergencies to protect the lives, safety and property of the citizens of Ontario.

Plans and operations must allow for the incorporation of the wide-spread competence, capabilities and civic spirit of both the public and private sectors of society.

The resources, human and material, necessary to provide for the security of the citizens of Ontario against emergencies are available in, and to, the province; to muster and apply them in the most timely and effective manner requires permanent and systematic concern, co-ordination and vigilance expressed in plans and preparations as complete, as current and as sound as they can be made and as the situations foreseen demand.

Aim and Scope

The aim of this paper is to describe in general terms the process of response to emergencies in Ontario.

Its scope will include the conceptual, organizational, planning, operational and recovery aspects of the process.

Not included in the scope of this presentation is the broad and important matter of measures to prevent or mitigate in advance the effects of emergencies.

Concept

Three principles can be said to govern the provincial approach to emergency preparedness: decentralization in planning and preparations, concentration in operations and flexibility in both.

Decentralization is primarily reflected in full recognition by the province of the responsibility and authority of municipalities to act within their own boundaries, secondarily by the lead ministry concept which cate-

gorizes emergencies by cause and assigns co-ordinating responsibility to the most appropriate ministry.

Concentration sees the application of municipal resources initially, followed by a build-up of supporting resources from other municipalities, the province, federal sources and, if necessary, other jurisdictions and agencies, all under municipal control unless circumstances indicate otherwise.

Flexibility is essential in recognition of the unexpected character of emergencies, which, to some degree, always confounds forecast, and the resulting divergence of operations from plans. Plans and operations must be adaptable while retaining their coherence under stress.

Organization

Despite the various tiers of municipal government in the province, as responsibility and authority devolve upon all levels, one description of organization can be used except for matters of detail.

The most apparent advantages of placing primary reliance on municipalities are the engagement of political attention and participation where they are in the most intimate connection with the citizen, the fixing of priorities on local situations and concerns and the provision of some assurance of an adequate initial response.

Ideally, organization to meet emergencies should differ as little as possible from normal. One important philosophical difference is that when lives, safety and property are at risk the imperatives of effective action require that authority be recognizable, comprehensible and obeyed.

Municipal organization therefore should be designed to facilitate the active authority of council in both planning and, particularly, operations. Councils will chart their own course but would do well to approve plans and monitor preparations. Heads of council will undoubtedly wish, and be expected, to direct operations; by their clear involvement in, and support of, the whole process an important moral impetus will be gained.

A committee of council may be the chief advisory body to council, assisting the head of council in directing operations, directing and monitoring planning and providing the conjunction between council and its staff.

While the central co-ordinating role in operations will fall on the head of council, in planning and in the

staff aspects of operations, the necessity for a designated co-ordinator will usually become apparent. This appointment might be filled by a member of council, a chief administrative officer, a director of planning or a specialist.

In every municipality there are agencies whose normal duties are oriented toward emergency situations and their personnel can, and should, play a prominent part in the process: police, fire, ambulance and hospital officials come immediately to mind.

Starting from the premise that all municipal departments will be expected to maintain their services under emergency conditions, many departments will become involved more directly in emergency planning and operations. Experience will normally show the need for a series of functional committees or sub-committees of a staff committee, perhaps called the emergency planning and operations committee.

It is at this point that the incorporation of the municipal resources of the private sector into planning and operations must be assured; these run from volunteer individual manpower through organizations trained and equipped for emergencies to the highly specialized capabilities of industry, the universities and societies like ham radio groups. Properly approached, tasked and kept informed, there are few limits to the participation of the community as a whole.

The next element of response available to municipalities is their ability to come to mutual aid agreements, both formal and informal, with neighbouring municipalities. Many deficiencies in local capability can be overcome, or at least reduced, by this sensible course which has the additional benefit of standardizing regional procedures.

Provincial ministries are widely represented throughout the province, enabling many municipalities [engaged] in planning and operations not only to draw on the specialist knowledge of ministries, but to remain in direct and frequent consultation with them and to have available rapid multiple channels of access to additional support.

Finally, it is only [in] recognizing reality that municipalities remain in contact with federal agencies locally represented and, in fact, with other jurisdictions whose proximity makes concerted action not only sensible, but mandatory. Normal discretion and a sensible passage of information should preclude unnecessary difficulties in the operations or recovery phases.

Moving from municipal to provincial organization, cabinet plays a moral, operational and planning role equivalent to that of councils.

The Cabinet Committee on Emergency Planning chaired by the solicitor general, advises cabinet, directs and monitors planning and, specifically in respect of nuclear contingencies and, by implication, in all major emergencies, assumes operational control. Its membership includes ministers and deputy ministers providing the conjunction between the cabinet and its civil service staffs.

While not all ministries are represented on the cabinet committee, all lead ministries are. Lead ministries and their assignments are:

- a. Energy – energy supply matters,
- b. Environment – spills of chemicals, oil or other contaminants or toxic agents; gas or oil pipeline breaks,
- c. Health – epidemics,
- d. Intergovernmental Affairs – funding and co-ordination of extraordinary expenditures on emergencies,
- e. Natural Resources – flood and forest fire, and
- f. Solicitor General – major air crash, snow emergency, other peacetime emergencies and war emergency.

Most ministries without lead responsibilities are involved in emergency planning and/or operations in a collateral sense.

The provincial emergency planning co-ordinator and his assistant, located in the ministry of the solicitor general, function between ministries, municipalities and other agencies to facilitate interaction.

Inter-ministry planning occurs on a committee basis similar to that at municipalities.

Ministries maintain planning and operational contacts with their federal counterparts, with the private sector and with other jurisdictions and agencies.

To focus and apply organization to emergencies in the event, it will be necessary to establish emergency control centres (ECC), associated with each of which will be a communications/information centre (CIC).

The purpose of ECCs/CICs is to provide for:

- a. the co-location, at appropriate centres, of responsible officials and their advisers,
- b. the timely collection and dissemination of operational information,

- c. the co-ordinated use of operational information to produce fully-informed, considered and rapid decision and clear comprehensive direction,
- d. the guaranteed passage of direction to all involved,
- e. the mobilization, assembly, deployment, utilization and sustainment of resources, and
- f. the transmission of full, accurate, consistent and authoritative information, practical advice and direction to the public without interference in the exercise of operational control.

The first ECC/CIC activated will be at the site where police, fire and ambulance authorities, with their communications, will establish co-ordinated relationships. Removed from the immediate urgency of the site, and activated when it has become clear that an emergency is developing, should be a municipal ECC/CIC supporting action at the site and deciding on related action away from the site. In a wider-spread emergency, a requirement may develop for regional ECC/CICs, municipal and/or provincial, and for activation of the provincial ECC/CIC in Toronto.

Planning

The first step in municipal planning is to list the categories of emergency to be expected, assigning priorities according to local concerns.

Scenarios should then be developed for each category, comprising the nature, scale, effects and impact of the emergency. These scenarios become the informed forecasts against which the municipal response is planned and measured.

It is important that scenarios be comprehensive, realistic and technically correct. Municipal planners may wish to draw on the considerable experience of ministries and the private sector to assure the validity of their scenarios.

A limited group of the most important scenarios will expose most of the common elements of response required and give clear indications of how to proceed with planning; subsequently, the group can be expanded to include the less urgent, but still existent, threats.

Having arrived at scenarios, the next step is to make a thorough analysis of each, aimed at providing an outline plan of action. Such analyses might consist of five basic steps:

- a. the situation, comprising:
 - 1) the scenario
 - 2) a listing of matching resources available and
 - 3) any geographical or meteorological variables of significance,
- b. the municipal aim vis-a-vis the forecast situation, including any limitations, priorities or timing foreseen to apply,
- c. a thorough investigation of all the factors, ie, circumstances, facts or influences, which can contribute to the result summarized in the aim, a study of the deductions resulting from this investigation to arrive at logical conclusions and a matching of these conclusions against resources to arrive at an assessment of tasks and how they are to be performed,
- d. the consideration of conclusions and the assessment of tasks to lead to optional courses of action available, and finally
- e. the selection of the most appropriate option and its statement in an outline plan.

Planning in detail can now begin.

The purpose of planning is to facilitate operations. Planning can reduce the unexpectedness of emergencies but not the abruptness of their appearance. It is important, therefore, that whatever the state of planning, a basic state of readiness for operations exists; a general provisional plan outlining threats, organization, capabilities, aim, concept of operations, responsibilities and administrative factors should therefore be the first result of planning, to be followed by increasingly comprehensive, detailed and particular plans in due course.

As scenarios and analyses are developed, it will become possible to identify specific elements of response and assign responsibility for them. In most cases, responsibilities will fit the normal roles of departments and agencies; in others, council may assign responsibility. Where foreseen functions cannot be met, private sector and mutual aid arrangements may cover the gaps or provincial assistance may be sought.

As there are few, if any, emergency functions which involve a single department or agency, the individuals assigned planning responsibilities will work, to a large extent, in the sub-committees of the emergency planning and operations committee previously mentioned.

Moving to provincial planning, the first responsibility of all ministries is to prepare to maintain normal

services under emergency conditions. The lead ministries develop co-ordinated plans in their designated fields supported by ministries with collateral responsibilities. It should be noted that certain ministries must be prepared to act where municipal government does not exist.

As with municipalities, much of this planning is carried forward by committees, including the Lead Ministry Co-ordinating Committee.

The regional representation of ministries permits ministry planning to move in coincidence with municipal planning.

The planning process at every level carries forward into operations and continues under the pressure of events. The first requirement for operational planning will be to modify plans as dictated by a situation now actual not hypothetical. Subsequently, it will be necessary not just to cope with the situation, but to move ahead of it. . . . This evidence of good emergency management will be most evident in the extent to which future action is governed by planning and not merely [by] reaction or expediency.

One final point on mature planning is the inclusion of standing operating procedures for routine matters. These are really drills whose purposes is to facilitate the transition from a planning to an operational posture, to ensure the performance of routine functions with minimum supervision and to thereby permit the greatest concentration of effort on non-routine matters without disrupting the system.

Operations

Essential not only to the initial response, but to the development of an appropriate ultimate response is the recognition of what is, or may become, an emergency; its identification in geographical, technical, social and other pertinent terms and the transmission of recognition and identification information in the form of warning to all concerned.

The populated part of the province is permanently under surveillance. Obvious anomalies are usually reported promptly, most often to the police, whose excellent communications, particularly in the case of the Ontario Provincial Police, and standing operating procedures allow rapid vertical and primary lateral warning.

It is important that initial warning be supplemented as soon as possible by additional warnings to municipal and provincial agencies not concerned in immediate

response in order that what is, or may become, an emergency is under the broadest scrutiny from the earliest possible moment.

Immediate action will almost always involve the police, fire and ambulance services early and their communications will initiate the first elements of support. Other forms of immediate action can be expected to follow, including the activation of a site ECC/CIC.

If there is evidence that the situation may grow, there is every advantage to be gained by the early activation of a municipal ECC/CIC and, in due course, a provincial [centre].

In the ECC/CIC, duty officers must ensure that the information flow is fully controlled. Messages must be logged and acted upon. No requirement for action must go unanswered. Situational change and operational reaction must be made to coincide as closely as possible.

Head of council with his principal advisers would be best located at the ECC; this would not preclude his providing moral support by visiting the site and its surroundings.

In direct active contact with the emergency are all those individuals and groups carrying out the directions of those in command and control positions. It is not intended to derogate from their essential functions by passing them by quickly. To connect them with the system let it suffice to say that their first rule in action should be to use their initiative to deal with their designated role or to assist in other roles as the situation dictates, but never to do so in such a way as to destroy or jeopardize the ability of command and staff to maintain control. All these elements and, in particular, volunteer elements, should shape their efforts and procedures to conform to the pattern expected by command and staff.

Conclusion

The process of response to emergencies from concept to conclusion is fundamentally one designed to enable a rational, planned, co-ordinated and effective human reaction to unnatural and difficult circumstances.

There is no question that human reaction will be more positive if it has been conditioned to the possibilities of emergency and particularly if it has, to some extent, been prepared to deal with them. A reasoned pro-

gram of public familiarization, education, training and practice will pay valuable dividends.

Emergencies carry in them the seeds of shock, paralysis and panic; preparation and particularly participation in measures to limit their growth and consequences will prevent their growth in individuals and [in] the population at large.

Widely decentralized planning and preparation, the ability to concentrate resources rapidly where they are required, and the flexibility of response to suit action to circumstances can be, and, to a large extent, have been, developed in Ontario and will serve it well when sudden dangers occur.

Chemical Transportation Emergency Response

Canada, a country with 23,000,000 people spread across an area larger than the U.S.A., must have a well-developed transportation system to move the products of its factories, mines and fields to our towns and cities as well as to our export centres. We have a good transportation system but even a good system can experience emergencies.

The title of this paper *Chemical Transportation Emergency Response* raises the question: why do we transport chemicals? Why can't the using industries be placed alongside the plants producing any potentially dangerous material? Or vice versa?

The requirement for transportation is largely based on the size and diversity of the Canadian market. To supply this market with competitive products, the size of an economical production unit often must be so large that its output will supply not only all of Canada, but provide a surplus to export. This means that customers located across Canada must be supplied with products transported to them. Even when a chemical plant can be located close to its major customer, it must be able to provide some of its output to other domestic and/or export customers.

We cannot insist that all production take place in one area. If [it did] one province would theoretically have all the jobs, the benefits of all the value added, taxes, etc. This is just not feasible for Canada.

Some have questioned why we need a chemical industry. Why not, for example, let other countries produce any potentially dangerous materials and avoid exposing Canadians to chemical hazard? The answer is simple. If we were to eliminate the production and movement of chemicals in Canada, we would close down most of the manufacturing sector of the Canadian economy. Over half of Canadian manufacturing requires the output of the chemical industry in order to continue to operate. Without it, Canadian industry shuts down, along with the service sectors which rely on it. The two most important basic industries in our

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whole economy are chemicals and steel. Eliminate either and you shut down the country.

Given that we cannot eliminate the production and, therefore, the transportation of chemicals, what can we do to improve the safety of those transporting operations?

The chemical industry is proud of its safety record which indicates that it is the safest industry in North America. This has been achieved through years of conscientious effort to equip, train and teach employees with the objective of maximum safety on the job. A major concern is the safe handling of dangerous materials. Safety consciousness is instilled into everyone and is a way of life, not only in the manufacturing operations, but also in the shipping and customer service aspects. . . . Extreme care must be exercised at every step if the public, and all who handle chemicals, are to be protected when [these commodities] are transported.

No system can operate indefinitely without an accident. How can we prepare for such an eventuality before it happens? Can we minimize the impact of an accident? The answer is yes! With efficient preplanning and preparation it is possible to minimize these emergencies. The approach used by the Canadian Chemical Producers' Association for chemical transportation emergencies is covered in their Transportation Emergency Assistance Plan (TEAP) procedure. This is attached as Appendix A.

TEAP calls have varied in importance from the discovery of a bag of dry, non-hazardous chemical on the roadway, to a major derailment with a spill of hundreds of tons of acid.

An overview of TEAP in sample year (1979) is shown in Appendix B.

TEAP relies on the shipper of the chemical to be the source of expert, detailed advice and assistance when an emergency takes place. This is provided initially by telephone, but, as necessary, it is supported by on-scene trained personnel. The availability of trained emergency response teams from chemical companies is becoming much more common with teams prepared to provide advice and assistance for emergencies involving their own products or similar products produced by others.

Chemicals can be moved safely and efficiently but [to do so] requires great care, knowledge, experience, and preplanning. It does not just happen! When we have all of these criteria and apply them in the proper manner, the transportation of chemicals is as safe as moving grain, coal or cars. . . .

Appendix A

Transportation Emergency Assistance Plan

Introduction

TEAP is a Canada-wide transportation emergency assistance plan, sponsored and managed by the Canadian Chemical Producers' Association (CCPA), with the objective of providing an effective information mechanism to help deal with transportation accidents involving any of the thousands of chemical products commercially manufactured in, or imported into, Canada.

The Canadian Chemical Producers' Association is a voluntary trade association founded in 1962 to represent the manufacturers of industrial chemicals and synthetic resins in Canada. The 63 members of the association . . . produce over 95 per cent of all industrial chemicals manufactured in this country. These industrial chemicals are essential materials for most manufacturing industries in Canada and have a total value in excess of \$5 billion with current exports of about \$1.9 billion. CCPA members have about 170 plants located across Canada and directly employ 26,000 people in their chemical manufacturing operations. Many thousands more are employed in other industries dependent on chemical products.

The Transportation Emergency Assistance Plan (TEAP)

The Transportation Emergency Assistance Plan is managed, as a public service, by the Canadian Chemical Producers' Association through the co-operation of the member companies who operate 'Regional Control Centres'. Regional Control Centres are communications centres located at major chemical production facilities and [they are] manned by technical experts.

Seven such centres provide complete nation-wide coverage 24 hours a day, 7 days a week. They are:

<i>Company</i>	<i>Regional Control Centre</i>
Allied Chemical Canada, Limited C-I-L Inc.	Valleyfield, Quebec Copper Cliff, Ontario
Celanese Canada Inc. Cyanamid Canada Inc.	Edmonton, Alberta Niagara Falls, Ontario
Dow Chemical of Canada, Limited Du Pont Canada Inc.	Sarnia, Ontario Maitland, Ontario
Industrial Chemicals Division of Canadian Occidental Petroleum Ltd.	Vancouver, B.C.

The primary function of TEAP is to provide immediate expert advice to people at the scene of a transportation emergency and then to establish contact with the shipper of the chemicals for more detailed assistance and follow-up.

History of TEAP

In 1967, the Canadian Chemical Producers' Association surveyed member companies to determine their interest in participating in a co-operative plan to provide technical assistance in chemical transportation emergencies. Although it was recognized that carriers were responsible for the safe transportation of chemical products, it was also realized that, generally, carriers had only limited technical knowledge of chemical products and limited resources for coping with chemical emergencies.

Recognizing these limitations and realizing that the chemical industry had both the experience and the capability of providing guidance to help ensure the safety of the public, transport personnel and local emergency forces, the Transportation Emergency Assistance Plan was agreed to by the industry and went into operation in January, 1971.

The plan was developed after consultations in Toronto and Montreal with representatives of the major transportation organizations, the Emergency Measures Organization, local and provincial police and the fire marshall's office. Originally, it was established in the provinces of Ontario and Quebec, with each of six member companies agreeing to provide and maintain Regional Control Centres. In 1972, however, the plan was enlarged to provide for a seventh Regional Control

Centre in Edmonton to serve the prairie provinces, and, in 1973, a centre was established in Vancouver to serve the province of British Columbia. In 1980, the two Regional Control Centres in Quebec were consolidated into the one at Valleyfield, Quebec. It should be noted that TEAP responds to *all* requests for information assistance, including those involving any transportation accidents related to the import of Canadian chemicals into the U.S.

To the best of our knowledge, the TEAP plan was a pioneering initiative, the first of its kind in the world.

Presently, the Canadian Chemical Producers' Association is assisting Transport Canada in developing a transportation emergency assistance plan of its own. However, the CCPA intends to keep the TEAP plan fully operational until we are convinced that any new or modified emergency information system is at least as good as our own.

TEAP: How It Operates

Basically, TEAP is an information service. A person telephoning the emergency number of a Regional Control Centre provides whatever basic information is available about the accident. The technical adviser at the Regional Control Centre obtains a call-back phone number and requests that the phone remain attended until all emergency communications are complete. The technical adviser records as much information as possible about the exact location, nature and status of the emergency, the name of the carrier, the name of the chemical(s) involved and the name of the shipper, manufacturer and/or receiver.

If the field situation at the accident scene requires it, the technical adviser at the Regional Control Centre provides preliminary information based on standard chemical reference texts.

He communicates as quickly as possible with the manufacturer or shipper of the chemical involved, briefing him on the situation and requesting the manufacturer to have his expert call back immediately to the authorities at the accident scene.

If direct contact cannot be made with the manufacturer or shipper, the Regional Control Centre technical adviser contacts other manufacturers or users of the chemical to obtain their assistance. If none of these are available, the technical adviser will, himself, frequently provide additional technical assistance by telephone or by going to the site. He may be able to offer emer-

gency assistance in the form of trained men and special equipment from his own company's resources; if not, he will attempt to find appropriate personnel and equipment at another source.

After the emergency report has been turned over to the manufacturer or shipper, the technical adviser will check back with authorities at the site of the accident to confirm that direct communications have been established between them and the chemical producer.

Dissemination of Information about TEAP

The scope, purpose and operation of the TEAP plan were communicated to all of the major emergency forces prior to its start-up in 1971. Further communications have since continued with police and fire departments, federal and provincial environmental authorities and transportation organizations. Articles, brochures, and information sessions are made available to all such organizations on request. Information about TEAP, including the emergency telephone numbers of all Regional Control Centres, are made available to be carried in vehicles transporting potentially hazardous chemicals.

Various government contingency plans now incorporate TEAP in any planned responses to emergencies involving chemicals. Examples are the Federal Contingency Plan and the Ontario Contingency Plan. As well, TEAP has been incorporated into the emergency plans of both CNR and CPR and the CTC 'Red Book'.

Finally, it should be noted that transportation emergencies involving other chemicals may sometimes involve chlorine. The transportation emergency response plan of the Chlorine Institute is CHLOREP. TEAP operates as dispatcher for the CHLOREP plan in Canada.

Appendix B

Overview of TEAP in Sample Year (1979: 12 Months)

In 1979 there were 100 calls to TEAP's Regional Control Centres. A third of these calls were not related to transportation incidents. They were prompted by a wide range of events such as the discovery of dangerous materials in school and university chemistry laboratories, leaks in old batteries and a leak in a hockey arena refrigeration unit.

<i>Category</i>	<i>Particulars</i>	<i>Number</i>
- Information only	Action not required; On-site team not required.	26
- TEAP call, but no TEAP team required to assist at site.	Usually requests for information only by police or fire officials handling accident. Twelve calls came from the U.S. requesting information about Canadian originated cargoes.	56
- Train derailment. No leakage. TEAP team sent to check.		4
- Train derailment. No rupture, but leakage. TEAP team sent to assist.		2
- Transport accident. No rupture, but valve leakage. TEAP team sent to assist.	Includes tanker truck and tank car accidents other than derailments, usually dome valve leaks.	8
- No derailment. Container rupture. TEAP team sent to assist.	One tanker truck accident; one tank car seam ruptured with no accident.	2
- Derailment. Container rupture. TEAP team sent to assist.	Includes Mississauga derailment.	2
Total: 1979 TEAP calls		100

Capabilities of Response

Preparedness to respond to emergencies and/or catastrophes is absolutely essential to our basic steel industry in particular and to all heavy industry in the north end of the city of Hamilton.

Management is responsible for the safeguarding and protection of our personnel, properties and production facilities at all times.

The major industries on the bay front and in the northern portion of the city of Hamilton have initiated up-dated studies for an orderly and pre-planned procedure for responding to the various kinds of emergencies and/or catastrophes which could possibly occur.

The nature of much of our heavy industry in Hamilton is such that failure to follow detailed shut-down procedures in an orderly pre-established manner could substantially magnify the immediate problem at hand.

The danger and probabilities of secondary explosions, fire, escaping gas problems, oil, water and air contamination, etc. could possibly be a bigger catastrophe than the original disaster.

The realization of the magnitude and multiplicity of the problems of either an internal disaster on our property or an external one in the immediate area of our plant has put an extra edge on our management responsibility for safeguarding our personnel and facilities.

We are, therefore, convinced that our capability to respond in the eighties is to be found in pre-disaster planning, to ensure the survival of our facilities, to protect our personnel and the community at all times and to speed the return to normal production and conditions as quickly as possible.

To accomplish this stated objective in the eighties, the following would be a typical outline of our heavy industries' pre-planning goals:

1. to establish a well co-ordinated and practical plan for the handling of industrial or civil emergencies or disasters,

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2. to establish warning systems and communication systems for notification of key personnel in the event of any such impending or actual occurrence,
3. to establish responsibility and method of rescue, shutdown procedure or repair method in the event of any emergency,
4. to provide procedures for the protection of plant gates, roads, waterways, equipment, personnel safety, etc.,
5. to provide methods to be used in furnishing first aid, medical services, ambulance service, safety equipment, bedding, food, etc. for the protection and assistance of personnel,
6. to provide procedures for the notification and co-ordination of local police and fire departments, hospitals, regional authorities, press, etc.,
7. to provide detailed shutdown procedures for each and every department within the plant, including manpower needs, [and the] time and materials necessary for the restoration of facilities and production as soon as possible after any such occurrence,
8. to communicate with, and participate in, the regional emergency planning activities,
9. to maintain an up-dated list of safety items, supplies and skill capabilities which would be useful or advantageous to the company and/or the community in the case of an area disaster.

Many of the larger companies have established internal disaster procedure or shutdown manuals which would be immediately activated upon the declaration of a total or limited emergency.

It would be impossible. . . to outline in any detail the contents of the various manuals and/or the systems and procedures in effect at any one company. I will, therefore, try only to highlight some of the more noteworthy items. . . . I hope I can demonstrate the degree of preparedness and the close co-operation being fostered between the regional authorities, general industry and our local hospitals.

The Hamilton-Wentworth region has established a Central Co-ordinating Control group with participating members from both the industry and hospital groups. This group would be the overall authority for the entire region.

Each company, however, has established its own centralized control group and emergency plan designed for the protection of personnel, properties, and production

facilities within its own property lines. The internal management group can direct, control and communicate with its personnel and, at the same time, be the liaison with the central committee.

The nerve system of our planning and preparedness is our communication network. Effective and rapid communication must be maintained and constantly updated.

We have installed scan receiving equipment from the Hamilton-Wentworth Regional Police so we may be constantly aware of any problem occurring in the region.

Our works police have our own two-way, two-channel radio control system with units in all vehicles and all gates; portable units are carried by the officers.

All employees have photo identification.

We have established a priority notification system for (a) the company in total, (b) each department. Wallet-sized telephone listings are supplied to works police and certain key employees, and a priority telephone calling system is listed.

Each department in the plant also has a shutdown procedure manual. This manual includes all the steps that must be taken in sequence to prevent further damage to equipment or personnel. Each step is [set forth] in a very detailed, prescribed manner and follows a critical path timed procedure to minimize the effect on other areas or departments.

These manuals cover such items as:

- a) use and control of all personnel,
- b) listing of vital plant areas — for protection of equipment,
- c) responsibility for, and location of, all valves and utility lines, i.e. oil, gas, water, incoming power, etc.,
- d) availability of safety equipment, supplies, bedding, etc.,
- e) emergency care areas, medical, first aid etc.,
- f) specialty skill availability, i.e. crane drivers, gas safety men, drivers, industrial hygiene experts, toxic materials and hazards experts, etc.,
- g) shutdown and start-up procedures for furnaces, equipment, etc.,
- h) mobile equipment transportation, including marine availability.

In our opinion, it is extremely important for our industry to maintain a close liaison with other industries in our immediate area and particularly with similar industries.

We also feel it is fundamental to maintain a very close liaison with the Hamilton-Wentworth region authorities. In addition, our works police, fire department and medical authorities are in constant close contact with their counterparts in the region.

The various industries of Hamilton's north end and bay front locations have responded to the requests of the Central Co-ordinating Control Group for information and input on items such as:

- a) vehicle surveys – up-dated traffic patterns and vehicle counts flowing to the main arteries on an hour-by-hour basis,
- b) fire and ambulance equipment – detailed descriptions of fire and ambulance vehicles plus on-board safety and emergency equipment,
- c) listing of vital skill availabilities such as: medical doctors and nurses, first aid attendants, chemists, toxic material and industrial hygiene experts, flammable gas and safety testers, explosive gas testers, material handlers, drivers, etc.,
- d) listing of medical supplies, fresh air breathing equipment, safety equipment, radio and communication devices, bedding, etc.,
- e) procedures for handling toxic materials, PCBs, asphyxiating gas, solvents, etc.

In summary, it is vital that a close liaison be established in a community between the regional authorities, industries and hospitals. There must be an awareness by all participants of the limitations, as well as the potentialities, of each. This knowledge, coupled with excellent communications, will aid considerably in perfecting plans for a sound and efficient response, if and when it is needed.

The pre-establishment of an operational plan to be applied in the event of a disaster is the most important phase of preparedness. It is too late to devise a plan after a disaster has occurred.

Capabilities of Medical Services and Hospitals in Responding to Emergencies and Catastrophes

I have been asked by the organizers of this symposium to comment on the capabilities of medical services and hospitals in responding to emergencies and catastrophes, whether natural or man-made. My answer, very simply put and which makes for short reading, is, that generally speaking, in this country they are less than adequate. There are many reasons for this situation and perhaps we might explore some of them.

There are many definitions of the term 'disaster'. The word itself is derived from *disastro*, which literally means not having a lucky star. Most authors, in articles reviewed for this paper, would appear to agree that it is an event or happening of variable size and number of casualties that results in an overload of a community's emergency and health care resources. The definition, of course, is meaningless. What is important is devising a way to prepare for such an event.

This, however, is where we start to run into problems. The purpose of the response of the medical services and hospitals to a disaster is basically twofold: to save human lives, and to reduce the morbidity resulting from injury. There are two main spheres of activity in this response:

- a) the provision of a medical response at the scene of the incident, if required or requested,
- b) the mobilization of all hospital resources to the required level to cope with the disaster.

Most medical services and hospitals, in order to achieve this response, have developed disaster plans or guides. The problem is that most of these are ineffective. This paradox has developed because:

- a) The plans usually have been developed in isolation resulting in them being insular and parochial and ignoring community needs and resources. These plans are oftentimes put together only because they are required by certifying bodies and are exercised once again for the same reason.

- b) The plans generally are too complex, inflexible and outline procedures that are so different from normal hospital activities that in a disaster situation they are not utilized.
- c) Most hospitals, because they are functioning in communities without a modern emergency health system (the fifteen criteria of which were outlined in the Emergency Medical Services Systems Act of 1973 by our neighbours in the United States), have difficulties managing minor disasters, i.e., MVAs, coronaries, effectively so it follows that their plans geared up for the 'big one' without this system in place also fail.
- d) As these plans are artificial and do not reflect extensions of normal operating procedures, they are usually practised by special disaster exercises. These exercises also are artificial and of dubious benefit according to many authors. They are held only, in many cases, to satisfy accreditation standards and usually only after much objection from all involved, resulting in a general lack of interest or a 'gay abandon' attitude.
- e) Special disaster teams that are organized and implemented only for these events and are not an everyday experience are of no value in a real incident. Visions of nurses and physicians in their hospital clothes up to their necks in mud and other debris at a disaster scene, attempting to work out of their environment with inadequate equipment, are only too real.

These above are only some of the many reasons why the medical and hospital response to disasters is less than adequate in this country. There are many more, and for those I refer you to the reading list attached to this article. . . .

Recommendations

How can we improve this situation?

- a) Disasters must not be looked upon as isolated incidents requiring special treatment. The most effective way of responding to a disaster is by escalating the normal management modalities of a community's emergency health system. It is obvious that if the community does not have a total emergency health system, it has a problem. It is imperative, therefore,

that commodities combine their pre- and in-hospital resources in an effective manner to cope not only with everyday incidents, but also large events. The region that handles ten or more casualties poorly can be counted on to do an even poorer job on 100 or 200 in spite of planning for the 'big one'.

There is no better single measure of the effectiveness and quality of an emergency medical system than its ability to handle a disaster. In order to do so, it must have sufficient manpower at both pre- and in-hospital levels; the manpower must be appropriately trained, a good communications system must be in place, response times must be minimal with sufficient vehicles, hospitals must be categorized with a system for transfers, public safety personnel must be integrated and mutual aid is a necessity.

- b) Hospital Disaster Manuals, when developed, should follow certain general principles. They should:
 - 1. be *simple* in order to take immediate effect,
 - 2. be *flexible* to allow for considerable variations in disasters,
 - 3. be *adaptable* to 'off-hours' when staff is minimal,
 - 4. be *universal* not defining names of specific senior people, but reflecting the personnel in the hospital at all times of the day and night,
 - 5. follow *normal hospital procedure* if at all possible, as most staff resort to habitual behaviour under stress.
- c) A disaster manual in its worst form is probably just that, a thick, tedious tome that gathers dust or is lost as soon as it is printed. The disaster outline should be presented in a way that takes into account that it will probably be used only once at the time that it is needed, and [then] in a hurry.

It should, therefore, be drawn up with this in mind. Essentials must be presented first. These include the disaster alert code, general principles of conduct, and a brief synopsis of the total plan. Further sections should contain more detail about the responsibilities and requirements of certain individuals or departments, some principles of medical care, and management of specific disaster problems, i.e., radiation, toxic gases, isolation, to name a few. These sections should be concise and

are best perhaps expressed as lists. The manual should be easily revised.

Some hospitals have gone to 'action cards' as a means of supplementing their manuals. Others with modern computer hardware are putting their disaster plans, along with other hospital policies, into this format once again to ease access to this information and also ease ability to upgrade and revise.

- d) Rehearsals have a certain soothing effect on the level of concern expressed by most administrators about disasters preparedness. Many participants agree that the exercise was neither realistic nor helpful once it was completed. Probably too much is expected of drills – they do not simulate the real thing very closely in terms of time, resource, response and, most importantly, do not duplicate the atmosphere of a true disaster. This is not to say, however, that they are of no value. They do instil familiarity, encourage personal and group inter-relationships, and bring out deficiencies. In effect, they do test the structure of the disaster plan, but not the substance.

Rehearsals should be broken into two types – major and minor. The major rehearsal must involve total community resources and response capabilities. This tests pre-and in-hospital components of the system. The exercise of a major disaster response is obviously time-consuming, expensive, and of such magnitude that the element of surprise is eliminated. This type of experience probably should be held every three years as it will take that long to implement changes resultant from the critiques and to prepare for the next.

Minor rehearsals can be very valuable and can be carried out frequently without much expense, and can zero in on certain components of the overall plan. They can also include an element of surprise to test true preparedness. The most obvious type of this rehearsal is the communications fan-out. It is of interest to note, however, that the most recurrent problem area identified in disasters, both real and exercise, is communications and staff availability. This problem continues to recur, despite the fact that it is one of the most easily tested and practised components of an overall disaster plan.

Some authors are suggesting a new type of rehearsal, which is to select the next most serious incident, i.e., fire, or traffic accident, and arbitrarily designate it as a disaster regardless of time, location,

or circumstances. It is felt this provides a realistic test of time-resource response, and, to a certain extent, organization and control. Patient triage, however, is not covered unless there are a coincidental significant number of casualties associated with the incident. This type of spontaneous drill is felt by those who have tried it to be very valuable and educational.

e) Medical response to disasters must be flexible to allow for on-site teams. These teams may not be needed, but in many instances [they] have proven invaluable in reducing morbidity and mortality. The functions of such a medical on-site team can be briefly listed:

1. to certify death,
2. to assess the severity of injuries, triage the survivors, and communicate with receiving hospitals,
3. to stabilize cardiovascular and respiratory systems of severely injured patients,
4. to relieve pain and anxiety, and provide comfort and reassurance,
5. to free trapped limbs, i.e. amputation.

In order to accomplish the above, the medical on-site team must be developed with a clear plan of function that has considered the following factors.

- The members of the team must be appropriately trained, able to work in the environment of a disaster, and be intimately aware of the community's disaster plans and resources and [of] how to utilize them.
- The team should be utilized, if possible, in the everyday workings of the community's emergency health system, and not kept in reserve for utilization only in major incidents of rare occurrence.
- The composition of the team should be variable and flexible according to the needs at the time, and may vary from one doctor, who is required only to certify death, to two or three multi-disciplinary teams able to co-ordinate activities, resuscitate, and perform definitive surgery.
- The team should have available to it, and be familiar with, communications systems able to

guarantee on-site, site to ambulance, police and fire personnel, site to hospital, and hospital to hospital interreaction.

- The team should be easily identifiable with those in command [and] easily distinguishable to all at the scene.
 - The team should have appropriate protective clothing and have the necessary supplies to function to their maximum capabilities. These supplies should be familiar to all members of the team, be colour-coded and packed according to international standards, and function.
 - There must be a co-ordinator of this team who is responsible for its activities. Some authors, however, point out that one co-ordinator is insufficient and suggest a three-tiered system with co-ordinators at the disaster command post, disaster site, and the casualty collection areas.
- f) Finally, the community's disaster response should reflect the capabilities of its medical facilities. Categorization of facilities is essential and will facilitate proper casualty management and optimum care. Obviously essential to effective use of categorized hospital facilities is open communication between these facilities and the disaster triage teams.

The above are only some of the more pertinent factors that must be explored if one is to upgrade the medical and hospital response of a community to a disaster. . . .

The appropriate response of a community's medical and hospital facilities to a disaster is essential to reduce total morbidity and mortality. Application of this response through the framework of the community's total emergency health system is, however, the only way that all of the benefits from such a response can be achieved.

Reading List

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⁵Gierson, ED, Richman LS. Valley Triage: An Approach to Mass Casualty Care. Trauma 15:193-196, 1975.

⁶Holloway, D. The E.M.S. System and Disaster Planning, JACEP 7:2, Feb. 1978.

⁷Finch, P, Nancekievill, D. The Role of Hospital Medical Teams at a Major Accident. Anaesthesia, 1975, Vol. 30, 666-676.

⁸Savage, PEA. Disaster Planning: The Use of Action Cards. Br Med J 3, 42-43.

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¹⁰Jacobs, L, Ramp, J. E.M.S. Approach to Disaster Planning. Trauma 19:3, 157-162.

¹¹Snook, R. Medical Care at Accidents and Disasters. Injury 10:1, 14-21.

¹²Rutherford, WH. Disaster Procedures. Br Med J 1975, 1, 443-445.

¹³Moorgate Tube Disaster. Br Med J 1975, 3, 727-731.

¹⁴Woods, D. Disasters, How Hospitals Cope. Can Med Assoc J May 1977, Vol. 116, 1194-1202.

¹⁵Williams, DJ. Disaster Planning in Hospitals. Br J Hosp Med Oct. 1979, 308-328.

Book Review

A Guide to Immunization for
Canadians
Prepared by The National
Advisory Committee on Immu-
nization, March, 1979

Published with the authority of
the Minister of National Health
and Welfare, Health Protection
Branch, Laboratory Centre for
Disease Control.

Available free from Bureau of
Epidemiology, L.C.D.C., Tun-
ney's Pasture, Ottawa, Ontario,
K1A 0L2 (613-992-6868)

This authoritative paperback is intended to encourage the standardization of immunization practices throughout Canada.

It is printed in two sections, one in English, one in French. Each consists of five parts, entitled:

- 1) General Considerations,
- 2) Recommended Immunization Schedules for Infants and Children,
- 3) Active Immunizing Agents,
- 4) Passive Immunizing Agents,
- 5) Immunization in Relation to Foreign Travel.

There are two appendices, one listing the immunizing agents licensed in Canada in April, 1979, the other mentioning immunizing agents not licensed but available in special circumstances. The major change since the book was written has been the licensing in Canada on June 9, 1980, of the Merieux Human Diploid Cell vaccine against rabies. This vaccine is now preferred in prophylaxis and post-exposure management.

No two immunization schedules are exactly alike. Different countries and different organizations may recommend slightly different programs, and yet all aim to achieve good protective effect. It seems there is little evidence to suggest that minor variations in the recipe make much difference to the final result. This is fortunate, for strict adherence to recommend dates is often impractical, impossible or ignored. Nevertheless, uniformity of immunization practice, certainly within one country, holds obvious appeal for health care professionals, who are often as puzzled as the public about the conflicting advice available.

But this book will not end the conflict in Canada. Most provincial departments of health have already distributed *A Guide to Immunization for Canadians* but in Ontario and Quebec it failed to win provincial

approval. Health care professionals in those provinces have received the book direct from Ottawa by mail and, from their own provincial department of health, a completely separate pamphlet on immunization.

The Ontario advice differs mainly in recommending the Salk polio vaccine administered by injection, and not the Sabin (live virus) alternative, which is given by mouth. According to the Ontario booklet, Salk vaccine is favoured because of apparent effectiveness, rarity of side effects, practicability and availability in Ontario.¹

A Guide to Immunization for Canadians provides a valuable summary, and discusses the indications for immunization. But although it specifies the intervals between successive doses of an immunizing course, it deliberately avoids advising dosage or route of administration on the grounds of variation among the immunizing agents available. A prudent point, but because of this lack, I suspect many physicians, pressed for time, will go straight to the manufacturer's data sheet or product insert for information, and not bother to refer to the guide at all, which would be a pity. Why not include these details in the guide?

M.J. James

¹Immunization and Related Procedures, A Guide for Physicians in Ontario prepared by the Committee on Public Health of the Ontario Medical Association and the Infectious Disease Service of the Hospital for Sick Children, Toronto, assisted by the Ontario Ministry of Health, Second Edition, revised February, 1980.

News and Notes

In April and November of each year, the Queen's University Occupational Health and Safety Resource Centre offers a training course in Industrial Audiometry and Hearing Conservation. This course has been designed to meet the ministry of labour's recommendations for appropriate training of audiometric technicians in industry. Students are recruited from among occupational health nurses and safety technicians, but those who supervise occupational health and safety programs would also benefit from the course. On successful completion of the course, students should have a knowledge of the concepts of hearing conservation, an understanding of the physical measurement of sound and the practical ability to undertake competent audiometry. They will also be aware of the ethical and legal considerations surrounding audiometry and be familiar with record keeping techniques. For further information, contact the Occupational Health & Safety Resource Centre, Queen's University, 25 Union Street, Kingston, Ontario. K7L 2N6.

Coming Events

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| May 4-7, 1981 | 27th Annual Technical Meeting of the Institute of Environmental Sciences. Theme is "Emerging Environmental Solutions for the Eighties".
<i>Los Angeles, California</i>
Contact B. Peterson, Executive Director,
Institute of Environment Sciences,
940 East Northwest Highway,
Mt. Prospect, IL 60056 (312)255-1561 |
| May 17-19, 1981 | Third International Symposium on Hand-arm Vibration. <i>Ottawa</i> . Further information may be obtained from Mr. A.J. Brammer, Division of Physics, National Research Council, Ottawa. K1A 0R6. Tel: (613)993-2840 |
| May 19-21, 1981 | Canadian Association for Biological Safety. Conference on Biohazard Safety, Queen's University, <i>Kingston, Ontario</i> . |
| May 24-29, 1981 | 21st Annual American Industrial Hygiene Conference, co-sponsored by the American Conference of Governmental Industrial Hygienists and the American Industrial Hygiene Association, <i>Portland, OR</i> . Contact American Industrial Hygiene Association, 475 Wolf Ledges Parkway, Akron, OH 44311 (216)762-7294. |
| June 8-10, 1981 | National Noise Control Conference, <i>Raleigh, North Carolina</i> . |
| June 15-17, 1981 | Canadian Congress of Laboratory Medicine, <i>Toronto, Ontario</i> . |

August 16-19, 1981

International Symposium on Education and Training Policies in Occupational Safety and Health and Ergonomics. Organized by the Directorate of Labour Inspection of Norway in collaboration with the ILO and the WHO. Further information may be obtained from the International Labour Office, Occupational Safety and Health Branch, CH-1211, *Geneva 22*.

September 25-30, 1981

20th International Congress of Occupational Health, *Cairo, Egypt*. For further information write to Professor Dr. Mahmoud Hassanein, Cairo University, 32 Falaki Street, Cairo.



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